8-471

MANAGEMENT STUDY

OF

NASA ACQUISITION PROCESS

Report of
Steering Group for
Study of NASA Acquisition Processes

JUNE 1971

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SPRINGFIELD, VA. 22161

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

78

N77-19196

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THE NASA ACQUISITION PROCESS

Report of the Steering Group

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INTRODUCTION

The Administrator of the National Aeronautics and Space Administration requested on September 1, 1970, that a comprehensive study be conducted of the NASA acquisition process. Recognizing that current policies and procedures more than adequately matched NASA's needs in its first decade, he nevertheless felt it was timely for such a study to be conducted in the light of an altered economic environment and a changing program.

The Acting Administrator, on September 18, 1970, defined the general scope of the study to include project and program planning for research and development, and those activities and procedures for acquiring goods and services from the definition of requirements through contract award. It is directed to the processes used for major acquisitions--those acquisitions leading to the use of formal source evaluation boards for Agency-level and for Field Center-level source selections.

The study therefore does not include within its scope areas such as small purchases and supply, university grants, advanced studies, supporting research and technology tasks, and minor construction. Although issues and processes involved in contracting for support services are included in the study, "make or buy" issues regarding such services are excluded. Finally, the study extends to procedures through contract award. Contract administration and project management have been excluded.

The Acting Administrator created a Steering Group to guide the study, monitor its progress, and present results to him; he appointed a project manager; and he empowered the Steering Group Chairman to appoint panels and teams to gather information and to study selected areas in depth.

This report presents the results of the Acquisition Study. The recommendations are summarized in Section I. The study revealed a number of principal considerations or primary areas of concern among key people involved in the acquisition process in both NASA and industry. These considerations, discussed in Section II, received major attention during the detailed review of procedures and processes, as discussed in Sections III through VIII. The specific recommendations resulting from the review of matters discussed in those six sections are listed at the end of each section. A plan for the implementation of approved recommendations is set forth in Section IX. The Appendix contains memoranda and materials authorizing the study and describing the study approach.

It is important to note that NASA flight projects involve considerations not generally applicable to the bulk of major procurements in other agencies. In virtually every case, a NASA flight project acquisition concludes with the development and operation of very few flight articles, which in conventional language might be characterized as prototype hardware. The Agency does not engage in the quantity production of standard flight articles. Even in those programs, such as Apollo, where a relatively larger number of flight missions are planned, there has been considerable programmatic evolution as the program has progressed, so that the latter missions are markedly dissimilar from the original flights. The study, especially the part dealing with project planning, has been conducted with these particular conditions in mind, and the report should be considered in that same context.

The report presents in a general, rather philosophical way the rationale supporting the various changes proposed, and the document should be read and used in just that way. It should not be regarded as a regulation or procedure prescribing detailed instructions for the various issues discussed. These regulations will be produced by the appropriate organizations and special committees established to implement the recommendations set forth herein, upon their approval.

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SECTION I

SUMMARY OF RECOMMENDATIONS

Project Planning

1. That the basic objectives of the current project planning policy be reaffirmed, i.e., that projects should evolve through a series of logical steps from concept through development.

2. That Agency procedures be revised to provide for greater flexibility in project planning to accommodate the unique characteristics of individual projects.

3. That early project definition activity be strengthened and deepened prior to its consideration by management as an approved project.

4. That Agency central planning cognizance of technology development and advanced missions work be increased, and that program planning provide an appropriate over-all setting for project execution.

5. That each Project Plan be designed to take optimum advantage of the competitive process in fulfilling the needs of that particular project.

6. That a procedure be established whereby a total plan for a proposed project is presented to the approval authority early in the life of the project to optimize the plan by keeping the expense of early project effort in proportion to total project cost.

7. That the Deputy Administrator review and approve project planning for selected critical Agency projects, and that the Program Associate Administrators review and approve the remainder.

8. That all Project Approval Documents (PADs) be approved by the Deputy Administrator, and that revised PADs come forward only in the event of "tilt limit" changes or proposed alterations in the plan.

9. That all Project Plans be approved by the Program Associate Administrators prior to project execution.

10. That management promote and encourage exchanges throughout NASA of cost estimating experiences and techniques.

Source Solicitation

1. That Requests For Proposal (RFPs) be clarified and simplified, as follows:

   a. That the Statement of Work describe precisely and concisely the product or service being sought, with clear identification of the important discriminators to be used in evaluation and selection.

   b. That elements which are not the really important discriminators for selection, but which do represent significant items for negotiation, such as safety and reliability plans, be set forth in separate segments of the RFP.

   c. The documentation requirements in the proposal for these optional elements be limited to the extent necessary to satisfy the evaluation and selection process, with the bulk of the documentation to be submitted by the winner or winners after selection.

2. That RFPs include evaluation criteria which NASA considers of greatest importance in measuring the suitability of the proposed product or service to meet the requirement, and that the general, relative importance

of these be indicated; that the listing of subcriteria in RFPs be eliminated; and that specific weights never be included.

3. That Program Managers be made clearly responsible for the content and quality of RFPs, and that their responsibility for prudence in setting forth requirements to meet optional Agency requirements be stressed.

4. That functional managers together with the Director of Procurement review the extent to which proposal documentation responsive to their respective areas may be reduced and simplified.

5. That a booklet be prepared to describe the acquisition process and that it be distributed widely throughout the industrial and educational community doing business with NASA.

6. That late proposals and unsolicited alternate proposals be referred to the cognizant installation director for his consideration and disposition.

Source Evaluation

1. That a uniform way for Source Evaluation Board (SEB) evaluation of proposals be prescribed which identifies and treats three separate activities:

a. Evaluation and scoring of factors bearing on mission suitability;

b. Analysis of cost proposals and assessment by the SEB of the probable actual cost for each proposer were he to be selected;

c. Identification and assessment by the SEB of any other factors not related to a. or b., above, but which the SEB believes should be considered by the selecting official in making the selection.

2. That the SEB handbook be revised to conform to the foregoing recommendation and to improve the utility of evaluation criteria in the evaluation process.

3. That the guidelines and practices for the preparation and review of evaluation criteria be studied toward improving their use in the evaluation process.

4. That management improve the efficiency of SEB operations by:

a. Assigning appropriate priority to SEB work;

b. Considering greater use of full-time Boards during the evaluation process;

c. Reviewing the Board's management and staffing plan;

d. Making sure that Boards are currently informed about SEB-related matters of consequence.

5. That line management employ proper safeguards to assure that technical transfusion does not occur during competitive phases of the procurement process.

Source Selection

1. That SEB reports and presentations to the selecting official be studied toward improving content and format.

2. That the NASA debriefing policy be revised so that a losing offeror may be told not only where his proposal was weak, but why he lost, and that this be done by comparing him with the winner in the manner described herein.

3. That, on Administrator-level source selections, the Administrator should designate a senior official familiar with the rationale for selection to participate in the debriefing supported by appropriate Field Center people familiar with the SEB assessment.

Support Service Contracts

1. That the present Agency policy for periodic recompetition of support services be continued.

2. In considering the consolidation of support contracts, that the expected benefits of consolidation be weighed against the impact such consolidations may have on competition and other public policy areas.

3. That phase-in plans be evaluated by the SEB and presented to the selecting official in a manner which separates them from the criteria scoring systems; and that phase-over costs be evaluated and presented separately from operating costs.

4. That Field Center support services operating plans be developed to serve as an institutional resources management tool, but that they not be used as procurement review and approval documents.

Management of the Process

1. That Center Directors personally monitor Center-level efforts for reducing acquisition lead times.

2. That management more aggressively supervise the processes relating to project planning and source evaluation and selection.

SECTION II

NASA ACQUISITION PROCESS: PRINCIPAL CONSIDERATIONS

The NASA acquisition process is intended to furnish an orderly progression of Agency programs from early concept through the development and operation of hardware; and to provide the best sources to participate in the execution of projects and the performance of supporting services.

The factors that contribute toward these ends are sound planning; operational efficiency and economy; competition; and innovation. The whole process must be managed so that work authorized in the Agency's budget produces an excellent technical product, at reasonable cost, and on an acceptable schedule. Sources must be selected in a fair and impartial manner.

The acquisition process is inherently a complex process, involving to some degree most if not all of the major functions of the Agency: long-range program planning; project planning from conception through development; budgeting and programming; and soliciting, evaluating and selecting sources to perform necessary work. It is an evolutionary process that reflects internal Agency experience and the effects of external considerations and judgments. However, in that it is evolutionary, it may also be vulnerable to proliferation of directives and procedures, and thus its policies and practices should be periodically reviewed.

We believe the NASA acquisition process is fundamentally sound. It has generally kept pace with the changing times, and has sufficiently met NASA's needs and objectives. The report should be reviewed and considered in that context.

As the study progressed through the Preliminary Survey Phase, it soon became apparent that a large number of people with whom discussions were held, both in NASA and among contractors, were concerned about the same things. Deeper study substantiated that these concerns were well founded, and led to an investigation of ways to correct them, or at least lessen their effect. These general concerns, which greatly influenced the scope and direction of the study, are the following:

The over-all process takes too long and should be shortened and simplified. The over-all cycle, including phased project planning, procurement planning, and the procedures for evaluation and selection of contractors, takes too long and is costly to the taxpayer, to NASA and to industry. It was noted by industry representatives that the long drawn-out nature of the acquisition process forces prospective contractors interested in a particular project to keep teams of people in being for long periods of time, and causes them to spend more money and manpower than would be the case in a shorter and simpler process. This condition often discourages competitive entry because of the high cost of staying the course, and makes it difficult to motivate a highly qualified staff to work in a process that is subject to delay, redundancy and poor productivity.

The most universally voiced comment heard within NASA was that the process should be shortened and simplified, and especially the span of time required between procurement plan release and contractor selection.

It is hoped that the over-all process for systems acquisition may be shortened in many cases by supplanting the existing elaborate baseline procedure for project planning with one that emphasizes the need for flexibility in project planning to accommodate the characteristic differences in projects, their complexity, and the environment in which they will be defined and developed. The case for project-unique planning is set forth in Section III.

The NASA Procurement Lead Time Committee in 1969 studied the problem of shortening the paperwork cycle for individual procurement actions. Implementation of these recommendations is continuing and the average processing time for major procurements coming to Headquarters has already been reduced by about twenty-five percent. As discussed in Section VIII, this is a noteworthy first step, and the lead time efforts should continue under the monitorship of management in Headquarters and the Field Centers. Section VIII also calls for more aggressive supervision by management of the source evaluation and selection process.

The view was expressed repeatedly throughout the study that the responsiveness of the proposal, the efficiency of the source evaluation and selection process, and the lead time required are all to a very large degree a direct function of the precision and clarity of the

Request for Proposal (RFP). A good RFP can often mean less paperwork, smaller SEBs, more accurate evaluation, and more pertinent information to the source selection official to aid him in his selection. RFP preparation is discussed in Section IV.

The Agency should continue its efforts to seek revision to the Armed Service Procurement Act of 1947 to recognize that, in appropriate circumstances for R&D procurements, competition through negotiation is a normal method of competition. Under the present law, the bulk of NASA procurements, which are negotiated and represent more than 90 percent of its procurement dollars, takes place under one of the seventeen exceptions to the formally advertised approach provided for by law. Certain of these exceptions require special review and authorization at different levels and contribute to the lead time problem without making a real contribution to the acquisition process.

The total cost of the acquisition process on a given project can be justified only if the benefits that accrue by virtue of the length and complexity of the process are worth the price. Project-unique planning and streamlined administrative procedures should help to assure that such justification obtains in each and every case.

More extensive preliminary effort and greater management attention should be devoted to project planning prior to Agency commitment to major design and development effort. Sound project planning is the sine qua non of an effective total acquisition process. Both industry and in-house personnel observed that at times it appeared projects proceeded prematurely into design and development, with RFPs being issued before NASA had sufficiently defined the work to be done.

Section III proposes that deepened effort be performed during a project's conceptual and definition phase, so that more definitive information relating to project and management planning for the over-all project may be considered by the approval authority at the time of his decision to authorize the project office to proceed with subsequent work. One valuable product of a deepened early effort would hopefully be a more realistic total project cost estimate at the time such estimates are required for project approval. A second product would be more precisely defined scopes of work to tighten the selection and negotiation phase.

The contractual period or periods should be tailored to the specific needs of the project, and their staging should constitute an important element of the project plan to be reviewed by the approval authority. RFPs for each competitive phase should be reviewed by management to make sure that they are as clear and concise as possible, that they provide an equitable and meaningful basis for effective competition, and that the product being sought is consistent with Agency program objectives.

The NASA source evaluation and selection process is generally not well understood by contractors and should be clarified. Although the views of some companies may be conditioned by their win/lose experiences, the general feeling expressed by companies interviewed is that they really do not understand why they win or why they lose various contracts. Oftimes there seems to them to be no correlation between the amount of time, money and talent invested in proposal preparation and enhancement in the chances of winning. One industry-sponsored study team erroneously thought that NASA develops two sets of weighted criteria, one for evaluation and one for selection, for each competitive procurement, and that industry is informed only of the former. As a matter of fact, weighted criteria are developed only for the evaluation process.

As discussed in Section V, the source evaluation and selection process should be clarified by recognizing three discrete considerations: the merit of the proposal to fulfill the mission requirement set forth in the RFP; costs and cost factors; and other factors important to the selection. Evaluation criteria should be used solely for the first of these: to measure the quality of a contractor's proposal to meet the mission requirement. Cost factors and other factors should be considered separately, and should not be scored in the weighted evaluation criteria numbering system.

The Source Evaluation Board should assure that evaluation criteria are correlated with, and reflected in, the RFP, and criteria should be reviewed for this purpose by management prior to the release of the RFP.

Finally, at their request, losers should be given timely debriefings after selection has been made to explain not only where they were inherently weak on an absolute basis, which is the current policy, but also to explain the main factors which caused them to lose. Debriefings

should include, in addition to officials familiar with the SEB assessment, someone designated by the selection official on the basis of his familiarity with the rationale for selection. Section VI describes the rationale for the proposed change to the debriefing policy.

NASA should avoid transfusion of technical information among companies during competitive phases. Technical transfusion, or the transfer of technical information between competing companies, or from the Government to one or more competitors, should be avoided during competition because such practice tends to stifle innovation, leads to a leveling of proposals, and inhibits competition over the long run. It is the widely held view among the industry representatives contacted that undesirable transfusion does take place.

As a practical matter, information is bound to leak over a period of time. If it does not leak from NASA, it will leak from company to company. The Government can minimize its responsibilities in this area by taking two specific actions: complete the acquisition cycle in the shortest practicable time; and change its "negotiation" techniques, as more fully described below.

One specific point during the acquisition cycle when unwarranted transfusion of technical information may well take place is during the conduct of written or oral discussions with offerors who submit proposals within a competitive range. These discussions are required by statute. NASA policy directives have already been amended to emphasize that the purpose of such discussions is to clarify ambiguities and uncertainties in proposals for all cost-reimbursement-type and all R&D contracts, regardless of type, thus enabling the Source Evaluation Board or other evaluators to understand fully the proposal of each proposer. This significantly changes earlier practice, which was to point out omissions, weaknesses and deficiencies, and to imply ways for the proposer to improve his proposal. This matter is discussed more fully in Section V.

As to the possibility of undesirable transfusion at other points during the acquisition cycle, management should be vigilant to provide adequate safeguards at all times. We must take care to ensure that concerns participating in various phases will be fairly treated from the standpoint of their competitive positions, and that none be

placed in a favored position by way of "transfusion" of information, whether that information is derived from other proposals or from Government data. When study contracts pertinent to a particular competition have been awarded, or are to be awarded, it is essential that the Government exercise care to preclude any unfair competitive advantage that might ensue from contractual relationships between the study contractors and competitors in the procurement at hand.

The problems of support services planning and procurement are unique and becoming increasingly complex, and should receive greater attention at higher management levels. A large number of major acquisitions that will require management attention in the near future are support service procurements. Based on recent experience, these procurements involve complex issues of growing importance to the Agency. Support service procurements involve not only those problems common to all acquisitions, such as proper planning, lead time, and source evaluation and selection, but matters unique to support services, such as the need for periodic recompetition, labor relations aspects, and so on. As an aid to greater management visibility in all of these matters, an organized way to review and forecast support services contracting activity at each of the NASA Field Centers should be developed. Section VII of this report is devoted to a full treatment of these support services contract issues.

The role of management in the acquisition process at all levels should be clarified and emphasized. Throughout the report, consideration is given to the manner in which management can and should be more effectively involved in the acquisition process. These considerations aggregate into three broad principles.

First, there should be greater management participation early in the process for total project and procurement planning than in many cases exists today.

Second, greater understanding is needed at each management level of its responsibilities in the process, especially with respect to SEB activities and the source selection process.

Third, formalized paperwork systems should be eliminated or reduced to the extent practicable in favor of greater personal involvement by key managers who participate in key procurement decisions. These management considerations are summarized in Section VIII.

SECTION III

PROJECT PLANNING

The Current Procedure

In October of 1965 the Administrator issued an Agency policy dealing with the planning and phasing of major research and development projects. This policy stated that project work would be undertaken only on the basis of plans and analyses that:

1. Clearly define the work to be done

2. Assess the programmatic, managerial, resource and schedule implications, and

3. Provide assurance that required technology can be made available when needed.

We believe these objectives are manifestly sound and should be reaffirmed.

This policy was brought up to date in May of 1968, and more detailed procedures were issued in August of 1968. The policy identifies critical decision points upon completion of three defined phases of work at which time management will evaluate the project planning and definition effort: to avoid commitment of major resources prior to adequate project definition; to be in a position to preserve significant future project options; and to optimize the benefits of each project effort in relation to other program activities.

The policy further states that the four-phased approach is not to be a rigid process: maximum flexibility will be provided as to the content and timing of any phase as determined by the nature of the project and availability of resources. To the extent practicable, competition is to be maintained among qualified contractors in each phase of project execution.

We believe that the policy and guidelines have served useful purposes in making it clear that project planning is to be approached in an orderly and thoughtful manner if the various tasks associated with the project are to fit into their proper place in the evolution of the project.

A feature of the full phased project planning process is that it is quite elaborate, so that the full process and the time required is justified only for a very large undertaking. In reviewing the projects that have been planned during the period that the current guidelines have been in effect, we have found no project where the full four discrete phases have been used. In all cases, phases have been combined, usually by joining Phases C and D (for which there are sound reasons based on the interaction between detailed design and development), and in other cases A and B, or B and C. Despite these combinations, however, some projects have been carried through too long and elaborate a phased project planning course.

We have also found that the application of the guidelines to any particular project varied, depending both upon the nature of the project and the interpretation placed upon the procedures, with management sometimes attempting to force-fit, to some degree, its project into the scheme, or else bending the scheme to meet their peculiar project needs.

Significant Project Planning Areas

Our review of project histories indicates that the following project planning areas warrant primary attention:

1. No project planning scheme will operate in an optimum way if programmatic or outside influences force it to proceed in a less advantageous manner. Since the Agency program is subject to external factors, all projects that span several budgetary years are vulnerable in this respect. Measures that are indicated to lessen these risks are (1) close interaction between over-all Agency planning and project planning, and (2) finishing the project as expeditiously as is compatible with sound procedure.

Agency central planning should be cognizant of technology development and advanced missions work and should encourage these efforts and reflect their results in over-all program planning. A function of sound over-all planning should be to seek to provide a setting so that projects can be pursued in an optimum way.

2. To a considerable degree, the problem of project cost forecasting is rooted in the fact that the planning, programming, budgeting, and Congressional approval cycle often draws forth a cost estimate far in advance of our

ability to produce a good one. This, in turn, is in part due to the fact that the content of the "A" phase of our present planning system does not provide sufficient definition of the project at a point in time that the Agency is required to submit its budget estimate. We believe that, to the extent permitted by funding, the emergence of a project as such should be held until some definition work has been done, at which point one can tell better what course the project will take and what it will probably cost. In the course of the review, we noted that this is now being practiced by some Agency planners, and we think it should be encouraged.

3. Flexibility in project planning should be given additional emphasis to accommodate the characteristic differences in projects, their complexity and the environment in which they will be designed and developed. Although some sort of project phasing is usually indispensable to project planning, the entire plan should be structured to meet unique project needs, with specific phases determined on the basis of milestones critical to that project.

The competitive aspects associated with the procurement activity for a given project should be tailored to the particular needs of that project. In general, competition will be sharper and broader as the process is designed so that it can be entered more economically, and it will be narrowed if the course to be run is made unduly long and expensive. Set procedures or rules of thumb are inadequate substitutes for judgment in this regard.

4. When a candidate project has reached an adequate stage of definition, it should be passed through a thorough review process to be considered an approved Agency project. It will have reached this stage through study and technology work, which may be various mixes of in-house and contracted effort. The review should be held prior to the initiation of project effort requiring project funding from Congress and/or the participation of industry in project execution. In this review, an over-all strategy for pursuing the project should be laid out, and a plan of action set up, all designed to fit the needs of the particular project, so that (1) over-all planning can be optimized and the expenses of definition and design kept in proportion to total project effort; (2) the contributions of all relevant functional and other staff can be made as the strategy is being formulated; and (3) appropriate points can be designed at which the project will be reviewed and either reaffirmed or altered. Such reviews can be set up to

occur, for example, at natural milestones or commitment points in the project's evolution. They may also take the form of "tilt limits," and be triggered at any time by failure to meet a set of specific prearranged controls (for example, on costs, schedules for required development of technology, fund availability, and so on).

In very large projects, when it is necessary to seek funding before the aforementioned degree of definition has been reached, the process described should be operated as well as can be in the circumstances. In such cases, a subsequent date for approval reaffirmation would be designated as a milestone, with the anticipation of a more definitive plan at that time.

5. The Deputy Administrator should approve the planning approach for selected projects to provide appropriate Agency management involvement in the key decisions affecting critical Agency projects. His participation on these designated projects would tend to strengthen generally the over-all planning process throughout NASA, and would provide a means for Agency management to review the soundness of our procedures, to interact with project planners, and perhaps to educate participants for planning work done at lower levels. His involvement in this manner would hopefully do for project planning what the Administrator-level SEB does for the source evaluation and selection process.

How the Process, as Visualized, Would Work

This section generally describes how the process incorporating the above ideas would work. Many of the things in our current procedure would, of course, be retained, and they are restated here so that the proposed new features can be set forth in the context of the over-all process.

New project ideas would continue to flow primarily from the efforts expended in the NASA Field Centers on in-house and contracted advanced research and technology and advanced mission studies, from activities of various advisory structures, and from the knowledge gained from past and on-going programs. The Agency should continue to provide an unfettered environment in the Centers where innovation can thrive and challenging new ideas for future programs can emerge. The Center Directors within over-all programmatic planning and guidance from the Program

Associate Administrators should continue to oversee these activities and should maintain a proper relationship between them and long-term Agency program objectives. The Associate Administrator should provide Agency-level review of these early efforts and approve the general content and level of activity.

As these local efforts progress, and as it becomes apparent that for various reasons some ideas have greater appeal than others, management would designate those warranting greater attention and/or the application of more resources. The selection of the more promising concepts and ideas to be pursued more vigorously should be made by the Center Director in consultation with the Program Associate Administrator, who would discuss these ideas with the Deputy Administrator and present them as potential candidates for inclusion in a NASA integrated plan.

These selected items would be subjected to a deepened effort (expanded Phase A in today's terminology) in order to develop sufficient data to support their candidacy as project options in over-all Agency planning. There may be cases where additional funding has to be sought from Congress to support this deepened effort. The product of this effort would be the following:

1. Proposed mission objectives, listed in order of priority, with associated cost estimates.

2. Rationale for the project in terms of the total program.

3. Payload with sample experiments, if a spacecraft; or performance requirements, with candidate payloads, experiments, or test articles, if a carrier, consistent with mission objectives.

4. A preliminary system design of a feasible but not necessarily optimum approach, and conceptual designs of alternate approaches.

5. Assessment of technical risk, including identification of technical problems and the criticality of their solution to follow-on efforts, identification of those problems currently being addressed, and a judgment of effort and time likely to be necessary to find a practical solution.

6. Identification of operational constraints, including launch and control capability, tracking and data acquisition, facility considerations, and institutional base support.

7. An estimate of schedule and costs of follow-on efforts.

Invariably, some of these selected candidate projects would, for one reason or another, turn out to be unattractive or unprofitable, and would not be pursued further. But other more promising investigations would progress until the people working on them become convinced that they should be considered as strong candidates for Agency projects.

The Program Associate Administrator would review these surviving candidates with the Deputy Administrator and they would agree on those candidates for which Project Plans will be prepared. They would also agree on those projects whose planning would be reviewed and approved by the Deputy Administrator.

Approved Project Plans would be required for all projects prior to implementation. A Project Plan would be prepared at a point in time when program management feels the project has reached an adequate stage of definition as a result of in-house and contracted study and technology work. The Plan should include at least one feasible concept to reach the proposed mission objective; sufficient technical data to provide a reasonable degree of assurance that there will be no devastating technological surprise; and adequate understanding of the project requirement so that realistic estimates of time and cost for subsequent effort can be made. Normally, the Plan would come forward prior to the initiation of project effort requiring project funding from Congress and/or the participation of industry in project execution.

The Project Plan would cover the life of the project through completion, including operational periods. It would be structured as a project-unique and logical sequence of major activities with clearly identified project milestones. The approval authority would review progress at these milestone intervals and would take any adjustment actions needed.

It is to be expected that in some cases detailed planning information will be available only for the initial phases and that plans for subsequent phases would have to be presented in a more general way. The Project Plan would contain the following information:

1. Project and mission objectives.

2. Technical summary.

3. Technology plan, including an assessment of identified technical problems and the timing and effort likely to be necessary for their solution, and identification of those components and subsystems requiring design and testing prior to commitment to project development.

4. Operations plan, covering items relating to launch, checkout, mission control, tracking and data acquisition, and other ground systems.

5. Analysis of environmental impact.

6. General management plan, including over-all project management structure, Field Center participation, use of special boards and committees, and roles of other agencies.

7. Procurement strategy. This would include, for example, discussion of issues such as whether prior studies or the proposed experiment selection would place one contractor in an advantageous position; whether this is deemed to be necessary to the project; and, if so, whether the work to be performed on contract should be competed or whether it should be placed sole source. Where serial competitive periods are being planned, their estimated cost to contractors and to the Government should be shown.

8. Project schedule, depicting via flow diagram the major milestones to be met from project approval through project completion. It would depict the relationships between project and procurement activities and the budget cycle. It would propose profitable utilization of holding periods during the budget cycle and between contractor efforts. These periods could be used for such activities as completion of work related to prior phases, and activities related to the solicitation, evaluation and selection of contractors for subsequent phases.

9. Resource plan, including total project cost estimate (and the basis for such estimate) presented by year and, if applicable, by phase for all project elements, including major hardware, experiments, operations and support. In-house manpower estimates would be presented for the life of the project. The facilities plan would cover major facilities and equipments required for development and test operations, as well as launch and operational activities.

10. Management approval and review schedule, including prospective milestones when project management would next review the project with the approval authority. These reviews would normally be scheduled to be held upon completion of significant project events not necessarily tied to procurement actions or budget cycles, but could be rescheduled in the event "tilt limits" are exceeded or if unforeseen problems or changing conditions occur which require attention of the approval authority.

11. Proposed "tilt limits" which would require approval by the approval authority before they can be changed, and would trigger project review whenever exceeded. These levels would be applied to key project features, such as project objectives, development of required new technology, number of missions, total cost and milestone schedules.

Functional offices in Headquarters and the Field Centers should provide support as the Plan is being developed by the Field Centers, rather than during time-consuming coordination and review cycles after the Plan has been prepared. It would be expected, for example, that the NASA Director of Procurement and his counterparts in the Centers would advise and guide the project office on procurement strategy as the Project Plan is being developed, rather than introducing their views after it has been drafted.

For projects previously selected for Agency top management review, the Program Associate Administrator sponsoring the project would present the product of his planning to the Deputy Administrator at a meeting held for that specific purpose. The Deputy Administrator would designate other program, planning, staff and functional officials who should attend; and the Program Associate Administrator would provide them with advance copies of materials to permit them to prepare for the meeting.

The Deputy Administrator would consider the over-all merit of the project and the soundness of the proposed plan. He would also consider the impact the proposed project would have on the projected resource levels of the Agency, and would weigh the proposed project against currently approved projects and other conceptual work in progress at the NASA Centers. He would also review it against other critical Agency-level considerations, for example, project compatibility with operational support capabilities.

The Deputy Administrator would approve the following:

1. Whether the project should proceed, and at what pace.

2. Primary elements of the Project Plan, including the milestones at which time progress reviews and project reassessments would be conducted by the approval authority.

3. The "tilt limits" requiring approval by the approval authority before they can be changed.

A Project Approval Document (PAD), hopefully not exceeding about ten pages, would be prepared by the Program Associate Administrator for each Project Plan approved by the Deputy Administrator or by the Program Associate Administrator. The PAD would no longer represent a yearly authorization of identified activity and associated resources. Revised PADs would be submitted only in the event of tilt limit changes, and not on an annual basis. All PADs would be signed by the Deputy Administrator.

The PAD would serve as the agreement between the Office of the Administrator and the program office for each project. PAD content would be limited to that information which, if changed, would require agreement of the approval authority. The PAD would include the specific tilt limits applicable to that project, and the milestones for management review.

The Project Plan would be revised, as necessary, by the project organization upon completion of the planning meeting with the approval authority. All Project Plans would be signed by the appropriate program Associate

Administrator upon PAD approval by the Deputy Administrator. The Project Plan would contain the information as outlined above and would serve as the basic agreement for the project between the Program Associate Administrator and Centers participating in the project.

The PAD and the Project Plan may contain significant resource data, such as total project cost, as one of the tilt limits, but neither the PAD nor the Project Plan would be used as an annual resource authorization document. Procedures of the budget and programming process, including the financial operating plan, fund authorization documents and the program operating plan, should be used for resource allocation and control.

One of the perennial difficulties surrounding our project planning is the uncertain fate of the Agency budget as it wends its way through authorization and appropriation. Regardless of our own project planning efforts, the annual Congressional funding level ultimately determines the size and pace of our programs. As it turns out, that pace is not always the most economical way of executing a project from a total project standpoint, as annual economic considerations dominate those of the longer term. No system can avoid this problem, and the best we can do is to make our approach flexible enough to make adjustments as necessary. Careful consideration must be given by Agency management to the project trade-offs as programmatic adjustments are made.

In conclusion, we find no difficulty with the basic objectives of the present project planning system; as stated above, they should be reaffirmed. At the same time, the process should be made more flexible to accommodate the characteristic differences in individual projects by making the elaborateness of the process in any individual case commensurate with the magnitude and complexity of the project.

It is hoped that the proposed approach will place greater motivation for making the system work with the Program Associate Administrators and the Centers. Although the revised approach would place greater emphasis on flexibility, it would encourage a more rigorous management regimen for planning, requiring a deeper effort in early stages before we seek authorization for more massive project effort.

The detailed instructions on project planning should be replaced by a more general guideline which restates our objectives, recognizes the major steps in project evolution, and sets forth the points discussed above, with some examples of alternate ways in which various types of projects could be executed.

Cost Estimating

We have reviewed the cost histories of a number of NASA projects and have discussed the techniques and problems surrounding cost estimating with a number of people in the NASA Centers and Headquarters. We have also examined various techniques in DoD.

The factors giving rise to potential cost growth may generally be grouped as follows:

1. Expansion of mission objectives.

2. Emergence of technical problems unexpected and unknown at the time original estimates were prepared.

3. Project management optimism regarding the costs of design and development, and the cost of solving the known unknowns.

4. Engineering changes to improve quality of mission performance.

5. Extra-program considerations, such as inflation, program stretch-outs for budgetary reasons, etc.

To the extent NASA is the master of its own fate in setting the pace for a project, we have found that our ability to estimate project costs is acceptable once a rather detailed specification at the assembly level is in hand. In terms of project planning for those projects representing quite modest technological advances, this level of information may be rather well understood upon completion of preliminary design, or right after the contractor for final design and development has been brought on board. For more advanced systems, where unknowns will usually exist well beyond the design period, it may not be until critical hardware has been actually built and tested that a Project Manager feels he can reasonably estimate what a project may finally cost, assuming a degree of stability in project objectives and extra-program influences. Thus it should be recognized that program cost estimates in PADs and Project Plans will continue to have a range of uncertainty.

In recent years NASA has made a concerted effort to develop more sophisticated estimating techniques including computer-based cost models employing parametric cost estimating relationships. These parametric estimating equations are especially useful in predicting costs early in the project's life when only limited technical and performance data are available. The major problem with these statistically-based estimating techniques in the case of NASA projects is the lack of a large number of similar historical R&D projects from which a statistically significant sample can be established. The reliability of our preliminary cost estimates will continue to improve as we increase the empirical cost data base from which we can derive sound cost predictive factors.

The nub of the problem is that the planning, programming, budgeting and Congressional approval cycle often demands a total project cost estimate far in advance of our ability to produce a good one. For example, there is something like a twelve-to-eighteen-month lead time between stating our project resource needs and actually having the money appropriated, and it is often during this very span of time that the preliminary work is being done which might add greater realism to our figures.

This fact of life is one of the considerations prompting us to suggest the project planning approach discussed above. The new approach would not solve all of the problems, but a deeper preliminary effort prior to project approval may produce more realistic run-out estimates for our major projects.

Recommendations on Project Planning

1. That the basic objectives of the current project planning policy be reaffirmed, i.e., that projects should evolve through a series of logical steps from concept through development.

2. That Agency procedures be revised to provide for greater flexibility in project planning to accommodate the unique characteristics of individual projects.

3. That early project definition activity be strengthened and deepened prior to its consideration by management as an approved project.

4. That Agency central planning cognizance of technology development and advanced missions work be increased, and that program planning provide an appropriate over-all setting for project execution.

5. That each Project Plan be designed to take optimum advantage of the competitive process in fulfilling the needs of that particular project.

6. That a procedure be established whereby a total plan for a proposed project is presented to the approval authority early in the life of the project to optimize the plan by keeping the expense of early project effort in proportion to total project cost.

7. That the Deputy Administrator review and approve project planning for selected critical Agency projects, and that the Program Associate Administrator review and approve the remainder.

8. That all Project Approval Documents be approved by the Deputy Administrator, and that revised PADs come forward only in the event of "tilt limit" changes or proposed alterations in the Plan.

9. That all Project Plans be approved by the Program Associate Administrator prior to project execution.

10. That management promote and encourage exchanges throughout NASA of cost estimating experiences and techniques.

SECTION IV

SOURCE SOLICITATION

Source solicitation for cost-type negotiated R&D procurements includes those activities involved in getting our requirements into the marketplace and providing an opportunity for competent offerors to submit proposals for meeting these requirements. We have generally reviewed these activities, and have found the areas of greatest interest, both in-house and in industry, to be the structure and content of the RFP; its use in helping the contractor understand the selection process; and the preparation and treatment of proposals. Each of these areas is discussed in that order.

Request for Proposal

Material contained in the RFP on the Statement of Work, the relative importance of various factors, and any other information guiding the contractor as to what it is that we want him to do, is of basic importance, obviously. Well stated, the RFP can generate a competition that will draw forth the best industrial efforts toward achieving our objectives. Poorly stated, it can cause poor proposals, confusion, acrimony, and the loss of time and money.

Most of the industry representatives surveyed spoke of their concern about the size and lack of clarity of some RFPs issued by NASA, and felt that a poorly drawn RFP is itself a contributor to lengthening the acquisition process and causes unnecessary additional expense both for the company and for NASA. Our study panel reviewed a number of recent RFPs and found that they contain a good deal of material of debatable necessity.

In general, the RFP contains (1) material needed for source selection, (2) material needed to describe the work to be done, (3) material to satisfy other Agency-created requirements, (4) material required by law, regulation, or executive order. Thus one difficulty is that the RFP contains several kinds of material put there by different people or by external requirement, so that the need for all the material is seldom evident to any one person.

People interested mainly in source selection tend to regard much of the RFP content as excess baggage, useful only for purposes of contract definition, contract management, and so on, and would recommend that we prune it out rather extensively. The difficulty is that much of this other material imposes definite obligations on the contractor, and sometimes involves significant costs. It cannot properly be left out for purposes of conducting the competition and then imposed later during contract negotiation. If it is eventually to be imposed on the contractor, it belongs in the RFP.

There are, however, two questions that should be raised regarding optional and Agency-generated RFP materials: the first is how much level of effort should be required of the contractor for each of the specified items and clauses of information; and the second is the manner in which the proposer whould be permitted to respond in his proposal on how he would plan to undertake some of the more important of these items.

The question of "how much" is basically a management question, and except for a few over-all Agency policy requirements, such as patents, is best settled by judgment. Such things as the appropriate level of testing, R&QA, documentation, management controls, and so on, depend for justification upon the nature of the project and must be determined on a case-by-case basis. Management must decide, for example, whether it is necessary to impose a preconceived, and possibly expensive, safety system upon a contractor who already has an effective one, whether modifications to his present system are acceptable, and so on.

Responsibility of cognizant management for the optional content of the RFP should be emphasized, and managers should work to nurture a prudent attitude of cost consciousness that will serve to filter out unduly burdensome and costly systems when they are not needed.

The Statement of Work itself itself should get special attention. These Statements often tend to be intricate and difficult to understand. When the nature of the job permits, they should be streamlined to describe clearly and concisely what we want to buy, and structured in a way that is mindful of the important discriminators identified for evaluation purposes. At the same time, they should be complete enough to describe fully the contractor's obligations.

The second question speaks to the manner in which the proposer should be permitted to respond to various optional Agency items in the RFP. It is the general practice that each proposal includes the proposer's specific plan on how he would meet certain requirements set forth in the RFP for items, such as R&QA and safety. These plans and data add measurably to the proposal package submitted for evaluation. As noted above, these items may constitute significant cost elements and must certainly be considered during evaluation of proposal cost factors. At the same time, these items are rarely, if ever, the important discriminators upon which a selection is based. Thus consideration should be given to the question of how much documentation on these various areas is necessary to be submitted with the proposal, and how much of it could be provided after selection. It is our view that optional elements should be limited to the extent necessary to satisfy the evaluation and selection process, with the bulk of the documentation to be submitted by the winner or winners after selection.

Issuance of an RFP commits the Agency to a course of action, and thus should have the approval of management, as well as agreement of the SEB handling the procurement, before it is released. We have found that today management review of RFPs varies among the Program Offices and from Center to Center. In some cases, the Center Director personally reviews the statement of work and criteria. In others, certain other key officials are involved. There seems to be a widespread practice of including key program people on the SEB for continuous management involvement, and they can participate in RFP review at that point. On RFPs for procurements that will eventually come to the Administrator for selection, he and other people in general management may become involved in the review of the more critical RFPs prior to their issuance.

These are, of course, all commendable management review practices. But there does not seem to be any common understanding throughout NASA of the responsibility of management for the content and quality of the RFP, or the importance of management review, or indeed what the purpose of such management review should be.

Special efforts should be made in important RFPs to be sure that as high a level of management as necessary is aware of the basis and implications of the RFP, and is prepared to live with the consequences through the life of the project. The review should assure that:

1. Contents of the Statement of Work square with Agency policies and objectives, and reflect what the Agency wants to do.

2. The Statement of Work sets forth as precisely and concisely as possible the product or service being sought, and clearly identifies the important factors that will be used in evaluation and selection.

3. The RFP does not contain unnecessary performance and technical specification requirements, or unnecessary management system and documentation requirements.

4. The RFP is so structured that those elements not essential to evaluation and selection are set forth in separate segments of the RFP.

Specifically, in the most important cases, the Program Associate Administrator should designate the person or persons who should review Statements of Work and evaluation criteria in RFPs where the Administrator will be the source selection official. The Center Director should designate the reviewing official in all other major procurements and he should arrange for Headquarters review to the extent he feels it is necessary in individual cases.

Understanding the Process

Industry has stated that it regards the process by which source selections are made as something of a mystery. One of the underlying reasons for this is their apparent lack of understanding or their misunderstanding of the function and purpose of evaluation criteria. For example, some people both in NASA and in industry incorrectly believe that "evaluation criteria" is synonymous with "selection criteria," and therefore encompass all features pertinent to selection, so that when scored and summed, their totals rank the proposers in order of desirability for selection, all factors considered.

Another impression, found in a private survey of Government aerospace procurement practices, is that NASA proposal evaluation is really a two-step affair, employing first, evaluation criteria to evaluate proposals on responsiveness to technical and operational requirements set forth in the RFP; and, following that, using formally drawn selection criteria to evaluate the degree of satisfaction offered by each source against the Government's over-all

objectives in the procurement. The impression, which does not reflect the actual manner in which our evaluations are conducted and selections made, was nevertheless gleaned from the survey team's interpretation of NASA's published SEB procedures.

There is clearly the need to clarify our procedures and our RFPs by stating explicitly that selection of a source will be done by judging which source is most advantageous to the Government, considering suitability of the proposed product or service to meet the stated requirements; probable cost; and other pertinent factors (see Section V).

The study panel reviewed evaluation criteria published in a number of recent RFPs and concluded that there appears to be a general tendency for criteria and very often subcriteria to be presented in quite a bit of detail. Although the appropriate level of detail will vary with the nature of the project, we have found a general preference in industry and among NASA managers for a less detailed listing of criteria, but identifying those factors considered of greatest importance to NASA, and for a grouping of these criteria in general categories of relative importance, such as greatest, middling and lesser, or something similar. Although they are predetermined by the SEB, specific criteria weights should not be included in the RFP, as such inclusion not only risks misunderstanding by the proposer as to their true meaning, but tends to give the appearance that the evaluation process is a mathematical exercise rather than the application of sound judgment by the SEB which employs weighted criteria as adjuncts to that judgment.

The suggestion has been made that the pre-proposal conference be used as a forum for presenting procurement process information relating to that specific procurement so that offerors may know what to expect, and when, after he submits his proposal. NASA policy today on pre-proposal conferences provides that the purpose of the pre-proposal conference is to explain or clarify complicated specifications and requirements to interested firms.

We recognize that more should be done with firms who are doing or may do business with us to clarify how our acquisition process works, but we doubt that the pre-proposal conference is the best way to do this. Considering the rather large number of items to be covered, including many of the things discussed in this report,

we favor the publication of a booklet addressed specifically to that purpose. The booklet should be distributed widely throughout the aerospace industry, which should be encouraged to invite some of our most knowledgeable people to discuss its content at industry-sponsored conferences and meetings.

Proposals

Subject to the relative competence of proposers, it was generally concluded that the quality of the proposal is directly dependent upon the quality of the RFP: if the latter is well organized and presents clearly what it is we want to buy, the proposal will tend to reflect the same attributes; on the other hand, if the RFP is muddied and unclear, the proposal can hardly be much better.

There is a general concern in the Agency regarding alternate proposals and late proposals. In the case of alternate proposals, the concern seems well founded as there is no adequate NASA policy in this area. In the case of late proposals, there is a policy but the involved people are not very happy with it.

We recommend that late proposals and unsolicited alternate proposals should not be accepted as pertinent to the particular procurement action for which they are being submitted. The mail should continue to be opened, and any late proposal or alternate proposal received should be referred to the cognizant installation director for his consideration and disposition. Unless the proposal in question convinces the installation director that the ongoing procurement action should be terminated as not being in the best interests of the Government, he should take no action with respect to the proposal.

Recommendations on Source Solicitation

1. That RFP's be clarified and simplified, as follows:

   a. That the Statement of Work describe precisely and concisely the product or service being sought, with clear identification of the important discriminators to be used in evaluation and selection.

   b. That elements which are not the really important discriminators for selection, but which do represent significant items for negotiation, such as safety and reliability plans, be set forth in separate segments of the RFP.

c. The documentation requirements in the proposal for these optional elements be limited to the extent necessary to satisfy the evaluation and selection process, with the bulk of the documentation to be submitted by the winner or winners afte· selection.

2. That RFP's include evaluation criteria which NASA considers of greatest importance in measuring the suitability of the proposed product or service to meet the requirement, and that the general, relative importance of these be indicated; that the listing of sub-criteria in RFPs be eliminated; and that specific weights never be included.

3. That Program Managers be made clearly responsible for the content and quality of RFPs, and that their responsibility for prudence in setting forth requirements to meet optional Agency requirements be stressed.

4. That functional managers together with the Director of Procurement review the extent to which proposal documentation responsive to their respective areas may be reduced and simplified.

5. That a booklet be prepared to describe the acquisition process and that it be distributed widely throughout the industrial and educational community doing business with NASA.

6. That late proposals and unsolicited alternate proposals be referred to the cognizant installation director for his consideration and disposition.

SECTION V

SOURCE EVALUATION

It is the function of the Source Evaluation Board to prepare, weigh, and organize material pertinent to source selection, while it is the selection official's business to consider the relevant factors, weigh them against one another, and make the choice. The relative functions of the Board and the selection official are more fully discussed in Section VI.

Variations in approach to evaluation and in the actual use of evaluation criteria among the SEBs have been found. In some cases, evaluation criteria have been limited to considerations relating to mission suitability, with costs excluded. In other cases, probably reflecting the more widespread practice, costs as such have not been included, but some cost-related elements have been included to one degree or another and are scored in the evaluation criteria. Other factors not relating to cost or mission suitability have been treated in various ways, sometimes within the scoring system and sometimes separately. There is clearly the need to clarify this process if our way of doing business is to be fully understood.

In making a selection, the official doing so must take into consideration all factors that are relevant to his task of choosing the proposition most advantageous to the Government. These can conveniently be placed in three categories:

1. Mission Suitability. Factors that indicate, for each competitor, the quality of work or product to be delivered, i.e., how well the requirements of the mission will be met if he is chosen.

2. Cost Factors. Factors that indicate, for each, what the competitor's proposal will likely cost the Government.

3. Other Factors. Any other factors pertinent to the selection decision.

Tasks of the Source Evaluation Board

The Source Evaluation Board should conduct its evaluation so that its results facilitate a proper selection by the selecting official. It is proposed that the SEBs approach their work in the manner outlined below:

1. Mission Suitability Factors. By properly assessing these factors, the Board evaluates what we are buying in terms of how well the mission requirements will be satisfied.

Ordinarily, there are a great many different and complex factors that bear on mission suitability, notably in hardware projects. The over-all mission suitability is necessarily an integration of these. Much effort and expertise is required to make this integration, to determine what are the strengths and weaknesses of each proposer's case from a mission suitability standpoint, and to find true discriminators. For this reason, SEBs are set up with the required skills to do these things, thus performing a valuable service to the selection official.

When the SEB has collected and examined the data, it performs an integration using numerical evaluation criteria and advises the selection official of its assessment of the suitability expectations for each proposer. It also separates those that will adequately fulfill the requirements from those that will not, when such a separation is justified.

Inasmuch as cost factors form a whole other category, and are not relevant to mission performance (not being reliable indicators of the relative excellence of the product), cost elements should not be included in the evaluation criteria for mission suitability. Some factors of the "business evaluation," however, including such things as proposed management structure and key personnel, belong in the evaluation criteria and in the scoring providing these factors are significant indicators of the quality of the product likely to be delivered.

Even the make-up of the proposer's cost estimate can be used as an indicator of how well the proposer understands the work. But the costs themselves should not be scored, for it is the business of the selection official to make trade-off decisions of incremental cost against incremental benefit. This should not be interpreted to mean

that costs are unimportant in evaluation and selection. The importance of cost as a factor in selection looms ever larger as more and more companies have demonstrated through actual performance their ability to perform technical work.

2. Cost Factors. The second basic category of factors to be considered is cost. The selection official can trade off cost versus performance; and, when appropriate, he can choose on the basis of cost.

Granted the cost uncertainties of cost-reimbursement type contracts, it is nonetheless the SEB's job to advise the selection official as to what can be learned about the probable cost, and in particular the probable differentials in costs among the various proposers.

The SEB should analyze the adequacy, realism, and significance of each cost proposal. The analysis should cover such things as an assessment of the cost of doing business with each proposer; the likely growth in cost; the features of the proposer's situation or work plan that would cause his cost to be greater or less than for other proposers; and the best estimate of the probable cost for each proposer were he selected, including whatever significant changes in the proposal would have to be negotiated. The analysis should include any other cost information that would be helpful to the selection official in his determination of the relative significance of cost in making his selection decision.

3. Other Factors. There may be other important factors that the source selection official should consider in making his final selection having nothing to do with the technical and managerial quality or cost aspects of the proposal.

Examples of this class of factors are: the possibility of labor strife resulting from some proposed arrangement; financial condition of proposers; possible desire to favor small or minority enterprise in some way; past performance of the company on other projects; and so on.

A proposer may be able to be responsive to such factors in his proposal, and if they are foreseen to be significant they should be mentioned in the RFP. On the other hand, such considerations may arise at any time up to selection, and if they do, they should be assessed and presented to the selecting official as a factor to be considered.

Past performance of a company might be grouped under Mission Suitability Factors and scored there, but we prefer to see it here. We believe past performance can become a significant factor, as a substantial body of knowledge has been gleaned through NASA's first decade on a company's ability to perform various kinds of work. The SEB should make its analysis by canvassing the NASA Centers and other customers and discussing with key project people the performance of the offeror on recent work of a related nature. Data banks on contractor performance should not be encouraged, as paper systems are costly and tend to be unsatisfactory sources for qualitative information of this nature. They would also be of no use as a data source regarding newcomers to space work.

Evaluation Criteria for Mission Suitability Factors

Well-prepared evaluation criteria are, as mentioned above, a service to the selection official to relieve him of the task of studying in detail all of the many features that are pertinent to a forecast of mission suitability. When the Board places its ratings on these criteria and adds them up, it obtains a number rating for mission suitability.

It is important to keep in mind that such numbers, while of value, represent the integrated result of many assessments of the strengths and weaknesses of various features of the propositions at hand, as judged by the proposals and the studies conducted by the Board. The selection official should be told what strengths and weaknesses were found, the importance assigned to them, and those weaknesses which are readily correctible and those which are "built in." He should be told, in general, what the real discriminators of mission suitability are. Only by an understanding of this kind will he be in a position to know just what he is buying in each case. He will, in short, know what causes the differentials in the numbers, and can assess what they may be worth.

As regards the construction of the numbers themselves, our study panel found a tendency toward the practice of using long lists of weighted criteria and subcriteria. This can lower the level of numerical evaluation to below the subsystem level and even to the component level where very narrow technical expertise is applied. This is likely to result in an evening out of scores among proposals, and may obscure the important performance discriminators in the process.

It is difficult to legislate the proper number and weighting of evaluation criteria because the level of detail will vary with the nature of the project. Ideally, the SEB should dig to the bottom and sift out those features that qualify as real strengths and weaknesses from a mission suitability standpoint, then see that these are properly weighed and scored. The more that scoring accomplishes this and avoids overlaying it with a body of other scored material that contains little of significance from a mission performance standpoint, the more the resulting integrated scores will be true indicators of relative mission suitability.

We suggested in Section IV that management review evaluation criteria along with the Statement of Work prior to issuance of the RFP to be sure that what the SEB considers to be important about the product is consistent with the objectives of the Agency. This suggestion should not be regarded as a diminution of the SEB role. The SEB is the keystone of the evaluation process, and its responsibilities in preparing evaluation criteria and correlating them with the Statement of Work prior to the management review should be emphasized.

SEB Operations

The number of people working on SEBs throughout NASA today adds up to a small army. Undoubtedly the more complex procurements require numerous people to perform evaluation, but our study group found that even in relatively smaller procurements there is a tendency to organize along classical SEB-committee-panel patterns which take a lot of people--perhaps more than is sometimes needed to perform a proper evaluation.

In relatively simple procurements, as is the case in many administrative support services contracts, large groups of evaluators are not required because the work is usually directed to a specific set of functions and does not involve evaluation of complicated hardware. In such cases, small but competent Boards serving full-time during evaluation could be the rule, with outside assistance provided on an on-call basis in areas of specialization, such as cost and pricing analysis.

Additionally, there are several instances where full-time Boards, composed of high-level people who temporarily moved away from their regular work areas, were used on

larger, more complex procurements, with Board members serving also as panel chairmen. It would seem that management should consider greater use of Boards serving full-time during the evaluation process as a means for speeding and improving the process of evaluation.

We have found throughout the Agency that SEBs are usually staffed with strong chairmen and solid membership, as measured by the incumbents' positions, competence and experience in fields of work directly relating to the subject matter coming under evaluation. There are two things that should be considered in preparing the Boards for the work of the SEB.

First, prior membership on an SEB should be a consideration in the selection of prospective Board chairmen, as such experience could help him in organizing and directing Board activities.

Second, management should make sure that new Boards are alert to some of the more important issues they are likely to face during the course of their evaluation, and should acquaint them with effective practices that have been used by past SEBs. Examples of subjects that could be included are how to construct rating systems, how to conduct written and oral discussions, and how to effectively prepare presentations to the source selection official. This could properly be done by setting up a mechanism to feed back to people who are or might become involved in SEB work the lessons learned during previous SEB experiences. The use of Center-level SEB advisors could help to handle this job by working with the group already established for this purpose in Headquarters by the Director of Procurement.

Technical Transfusion

Technical transfusion is acceptable provided it does not occur during competitive periods and involves only that information which NASA owns. But the view is generally held by industry that during competition transfusion of technical information between companies, or from NASA to a company or companies is taking place, and that the practice should be discouraged because it is disruptive to the free enterprise system and the objectives of competition. It also tends to deemphasize the merit of the proposal as the basis for selection.

One point in the competitive process at which such undesirable transfusion might possibly occur is during the conduct of written or oral discussions with offerors who submit proposals within the competitive range. Such discussions are required by law.

Prior to December 1970, it was NASA policy to use such discussions to point out to the offeror deficiencies, omissions and ambiguities in his proposal and to provide him with an opportunity to clarify, correct, improve or revise his proposal. The manner in which discussions were actually being conducted by the Centers differed, based upon their interpretation of the meaning and intent of the policy. The possibility of undesirable transfusion arose in at least one case where the policy was interpreted to mean that written and oral discussions were to be used to "even out" competitive proposals. Under this interpretation, there was the danger that NASA might identify to one proposer those areas in which another had achieved a higher rating, or that NASA might give one offeror information to remedy his proposal that could give him a competitive advantage over another.

A revision to this policy was already under way at the beginning of the study and was implemented in December 1970. The new policy provides that, in all cost-reimbursement type contracts and in all R&D contracts, ambiguities and uncertainties in proposals will be pointed out, but not deficiencies. The new policy emphasizes that practices amounting to auctioning techniques are prohibited.

The one additional suggestion we would make relating to oral discussions is that they should be limited, whenever practicable, to one session with each offeror, and that additional sessions should be held only when unforeseen circumstances dictate their necessity. Multiple sessions tend to draw out the process and increase the risk of improper "transfusion."

The above proscriptions, of course, do not relate to negotiations with an offeror or offerors after selection, when transfusion of non-proprietary data, where the property of the Government, is entirely proper. Nor does it apply to cases where the evaluation and selection process results in essentially a dead heat, and the selecting official requires full and final negotiations to be conducted with more than one offeror. In this case, the same information must be given to all contractors with whom negotiations are being conducted.

The new policy directive addresses the problem of transfusion at only one point in the competitive process: during written and oral discussions. A word should be said about another point in the process where undesirable transfusion may occur, and that is during competitive study phases. When proposals for follow-on efforts are to be deliverable items from competitive phases, transfusion among competing contractors should be excluded during the competitive phases. For those cases where the competition will be reopened or the Government will issue an RFP following the competitive phases, desirable transfusion during the competitive phase is acceptable. In the former case, line and project managers should be vigilant that proper safeguards exist and are used to protect the data of each proposer during these competitive periods

Recommendations on Source Evaluation

1. That a uniform way for SEB evaluation of proposals be prescribed which identifies and treats three separate activities:

    a. Evaluation and scoring of factors bearing on mission suitability;

    b. Analysis of cost proposals and assessment by the SEB of the probable actual cost for each proposer were he to be selected;

    c. Identification and assessment by the SEB of any other factors not related to a. or b., above, but which the SEB believes should be considered by the selecting official in making the selection.

2. That the SEB handbook be revised to conform to the foregoing recommendation and to improve the utility of evaluation criteria in the evaluation process.

3. That the guidelines and practices for the preparation and review of evaluation criteria be studied toward improving their use in the evaluation process.

4. That management improve the efficiency of SEB operations by:

    a. Assigning appropriate priority to SEB work.

b. Considering greater use of full-time Boards during the evaluation process.

c. Reviewing the Board's management and staffing plan.

d. Making sure that Boards are currently informed about SEB-related matters of consequence.

5. That line management employ proper safeguards to assure that technical transfusion does not occur during competitive phases of the procurement process.

SECTION VI

SOURCE SELECTION

The Source Evaluation Board presents the results of the following assessment to the selecting official:

1. An assessment of the presumed quality of the work to be performed, as judged from examination of proposals and subsequent discussions with proposers.

2. An assessment of cost proposals, including what the Board thinks it will probably cost to do the work as proposed by the various proposers.

3. An assessment of any other factors the Board considers pertinent to the selection.

The selecting official considers the data presented, seeks the opinions of responsible line and functional staff, and selects, on the basis of the proposal or proposals deemed to be most advantageous to the Government, one firm for award of contract, or two or more firms for final negotiations.

It is important to keep clearly in mind the different functions of the Board and of the selecting official, so that the Board does not substitute for the latter, or seem to do so. Boards are appointed to ensure impartiality, security of information, and an appropriate concentration of expertise. They are thus well equipped to weigh the factors important to mission suitability, and to combine these into an over-all assessment of relative suitability. They are also well equipped to estimate relative cost, and to identify other pertinent factors. They should not, however, be required to trade off cost against performance. Such broad resource allocation trade-offs are classical functions of management,

and should be made by the selecting official, in consultation with his principal program and functional staff advisors.

SEB Report and Presentation

The two instruments providing the Board's assessment to the selecting official are a comprehensive written report and an oral presentation which summarizes and highlights information contained in the report. We have found that the quality and content of both of these vary widely.

The way in which these reports are prepared should be reviewed to see if they can be streamlined as to content and made more uniform as to format, thus making the task of assimilating them less time-consuming. It is suggested that samples of some of the better recent reports be used as guides for SEBs working on forthcoming procurements.

As to the presentations, the Action Group has taken steps to focus them on the comparative strengths and weaknesses of contractors by eliminating much of the background material properly included in the report but not really necessary in the presentation; and by omitting other data which does not give rise to issues before the selecting official.

Debriefings

Debriefings are conducted upon request of a losing competitor after selection of a contractor for negotiation but prior to contract award. The current debriefing procedure is to point out to the loser the weak features of his proposal, so that he can learn from his experience and do a better job next time. Thus the current practice is to avoid comparisons among the proposers, and between the firm being debriefed and the winner. He is told where he was weak, but not necessarily why he lost to the winner.

The procedure is reasonably well suited if selections are made primarily on technical grounds. The proposer is advised of a number of features in his proposal that in our view could have been improved. These features are

necessarily part of a whole array of technical factors, and it is implicit that the integrated evaluation of the winner's array outweighed that of the losers. A point-by-point comparison would not be a very practical thing, and is not and should not be done.

The current procedure is not so satisfactory when the selection hinges on other than technical factors, such as cost. If, in fact, the winner has been chosen on the sole basis of cost, it is difficult to debrief the loser without engaging in a direct comparison. A similar situation prevails when the selection involves a trade-off between technical factors and cost, or between cost and other factors, and so on.

Our survey of industry attitudes indicates that many proposers are not satisfied that they understand sufficiently why they lose, or even why they win. They feel that competing in response to our Request for Proposal can be a costly process, tying up good people for long periods of time. It is thus a matter that a company does not undertake lightly. They believe they will be aided if they understand better the reasons for wins and losses, and will be able to plan more effectively. The over-all quality of competition could also be expected to improve.

Today losers can, if they wish to protest, find out more than current debriefing practices tell them; and some have chosen this route. We should amend our debriefing policy so that the proposer can be told without his resort to protest why the winner was chosen over him. We should compare him with the winner, but not with other losers.

Our policy should provide that, if the winner is selected on the basis of cost, the debriefee should be told at the debriefing that such is the case. If the winner is selected on the basis of other factors, the debriefee should be told what those specific factors are.

If the winner is selected on the basis of the quality of his proposal to satisfy the mission requirement, the loser should be told that in a general way, but the debriefing official should not engage in a point-by-point comparison of all elements considered in the evaluation criteria as this would be neither practical nor productive. The firm being debriefed would, however, be informed of the specific mission areas where the Agency adjudged him to be weak, and whether or not these weaknesses were factors in his not having won. In this way he may learn from his experience and possibly improve his proposal next time.

In cases where the selection has been made by the Administrator, he should designate a senior official familiar with the rationale for selection to participate in the debriefing, and this official should be assisted by Center officials familiar with the SEB assessment. In all other cases, the Center Director should designate at an appropriate management level, the debriefing official or officials.

Recommendations on Source Selection

1. That SEB reports and presentations to the selecting official be studied toward improving content and format.

2. That the NASA debriefing policy be revised so that a losing offeror may be told not only where his proposal was weak, but why he lost, and that this be done by comparing him with the winner in the manner described herein.

3. That, on Administrator-level source selections, the Administrator should designate a senior official familiar with the rationale for selection to participate in the debriefing supported by appropriate Field Center people familiar with the SEB assessment.

SECTION VII

SUPPORT SERVICE CONTRACTS

The preceding sections, except that on project planning, apply with equal vigor to both major hardware and support services procurements. There are, however, several issues that are peculiar to support services, and which should be discussed separately.

Need for Recompetition

The objectives of recompeting support service contracts, in addition to complying with national policies in applicable statutes, are to gain superior performance and, wherever possible, to improve costs; and to ensure that no one company has a monopoly over part of the operation.

In the typical support service contract, a group of contractor employees work, generally on a cost-reimbursable basis, at some task, usually of a continuing though fluctuating nature. Under these circumstances, the cost of the work to the Government includes the following:

1. The contractor's fee, plus his allowable overhead, General & Administrative (G&A), etc.;

2. The money paid to his employees and reimbursed by the Government;

3. The effect of any other allowable costs, such as fringe benefits, severance pay, etc., paid or accrued.

The contractor from time to time adjusts his terms and conditions of employment, in response to union contract terms or to the fluctuations in the employment market locally or company-wide. Such adjustments will, in the typical case, be reimbursable under (2) and (3) above. To the extent that the adjustments are truly representative of the local employment market, they will be acceptable.

We clearly need, however, to guard against the situation in which, for whatever reason, the contractor's terms depart from the going terms of employment in the area. Here the Government cannot only suffer under (2) and (3), but also in an amplified sense because unreasonable rates and costs tend to increase prevailing area costs to the disadvantage of the Government not only in the particular contract but with respect to all its business in the area. This situation can arise in a variety of ways: an error in assessing the local going terms; external causes, such as changes in a contractor's over-all situation; bargaining with less zeal than might be the case if the contractor were not being reimbursed; or even deliberate granting of, say, liberal severance pay terms in order to make it expensive for the Government to change contractors.

Whatever may be the details in any given case, the basic fact is that the Government reimburses for labor costs without direct representation at the labor bargaining table. In this situation it needs a policy which motivates contractors to maximum cost consciousness. It also needs to ensure itself that the contractors perform up to the quality expected. The Government's tool for accomplishing this is periodic recompetition, actual or potential.

Frequency of Recompetition

Recompetition always involves a cost, both tangible and intangible. There is the cost of phase-over, and the expenses of running the competition itself: contractors' bid and proposal expense, NASA salaries, involvement of key NASA people. There may be, to some degree, disruption of work--changing of key people, possible labor union difficulty of one kind or another, possible morale problems, possible legal problems, and so on.

Both cost and benefit sides of the balance sheet will contain factors that are highly uncertain. We cannot know in advance how much better, or more economical, a job another contractor might do--or how much disruption and conflict might be generated in the process of installing him and so on. Consequently, the attempt to calculate,

on a case-by-case basis, whether to recompete or to renew a given contract is likely to result in few figures but a lot of speculation. Moreover, a decision to recompete in any single case cannot be viewed in isolation because of synergistic effects, for the behavior of service contractors on the job is bound to depend to a degree upon whether NASA maintains a credible general policy of recompeting, and how it is handled.

In these circumstances, an optimum recompetition policy will not be achieved by attempting to decide, on a case-by-case basis, whether a given recompetition is worth the cost that it is deemed to involve, and acting accordingly. There should instead be an Agency recompetition policy designed to maintain a proper synergistic effect while allowing flexibility for special cases. The policy should:

1. Maintain a credible Agency posture of using recompetition regularly at sensible intervals.

2. Provide for cancellation and/or recompetition at the earliest programmatically-acceptable opportunity in cases of poor or less than satisfactory work performance, unjustified cost increases, etc.

3. Provide proper incentives, including the possibility of noncompetitive extension of contract within the original plan, for cases of outstanding performance. The latter should comprise not only exceptionally high quality work but also demonstrated ability to join with the Agency in bringing off cost-saving and productivity-increasing measures.

These policy objectives are well covered by the present guidelines that provide for periodic recompetition. We have generally followed a rule of thumb that institutional service contracts should be recompeted every three years and mission-oriented service contracts every five years. Options to recompete both types of contracts can be exercised annually when contractor performance indicates that it would be in the best interest of the

Government to do so. Factors other than performance which influence the length of these contracts are the technical level of the requirement and the time span of the program being supported. The latter is particularly important when support is of a highly technical nature to a fast-paced program with critical milestones.

A number of the Centers during recent years have been consolidating numerous small support contracts into relatively few large ones. The primary advantage in doing this is that it reduces the cost of contract management and administration for both the contractor and the Government. It is important, however, that the benefits be weighed against the impact that such consolidations, especially in cases where widely divergent tasks are grouped in the name of efficiency under a single contract, may have on such areas as restraint of full competition, ability of small business and minority firms to compete for contracts, increased costs by "fee on fee" and application of G&A to subcontracts, labor relations difficulties because of mixed skills and corresponding union affiliations.

Phase-Over Costs

When a follow-on service contract is awarded to other than the incumbent, special and unique costs, or phase-over costs, are incurred. These costs include those involved by both the incumbent and the new contractor in getting the new contractor up to speed; those specific charges involved in closing out the incumbent, such as mass severance pay, relocation pay and fringe benefits; and those intangible but very real costs flowing from such things as learning curve effects, labor unrest, and low morale.

The question arises as to how these costs should be regarded by the selecting official. One view holds that such costs are the costs of competition and should not be a factor in source selection. Another view says that phase-over costs are real costs which NASA would not incur unless the Agency elected to change contractors,

and thus they should be a factor in source selection. All agree that the selecting official should at least see and be aware of these costs.

It would seem that the selecting official should consider the problem of phase-over as a significant factor in the selection process. Each competitor's phase-in plan and the SEB's evaluation thereof should be presented in a manner that separates it from the weighted criteria scoring system, since no such plan is required of the incumbent. These phase-over plans often vary markedly, and could be swing factors in selection. Phase-over costs should also be evaluated and presented separately from the Government's assessment of the contractor's cost estimate for doing the work once on board. Presented this way, the selecting official can apply his judgment in trading off phase-over considerations against cost and other factors pertinent to the selection.

Support Service Operating Plan

Support service contracting in NASA is a subject of widespread interest for a variety of reasons, such as the magnitude of the total effort, small business and minority enterprise considerations, issues relating to recompetition and consolidation, civil service and support contract relationships, and labor-management relations--all in an environment of programmatic uncertainties and change. Support service problems command a large amount of management time at Agency and Field Center levels, and there is every reason to believe that senior management involvement will continue and indeed may have to increase in the future.

In view of this, we have found general agreement that a more systematic mechanism should be developed to allow management at all levels to review the status and planning of our support service activities on a regular basis. This mechanism could take the form of a Center-level support service operating plan which would accurately reflect the present situation of support contracting at each Center. It would do this by

presenting information identifying support contractor and civil service effort by functional area, including manpower, dollars and facilities; contract period and type of contract; and plans for the next five years, including resource projections, anticipated combinations of effort, and other issues and noteworthy trends. The plan, which should be submitted to Headquarters annually, should not be a procurement review or approval document, but rather an institutional resources management tool portraying the total capability and balance of skills at each Center. We have found fledgling plans in each program office and believe they could serve as the basis for the new mechanism.

Recommendations on Support Service Contracts

1. That the present Agency policy for periodic recompetition of support services be continued.

2. In considering the consolidation of support contracts, that the expected benefits of consolidation be weighed against the impact such consolidations may have on competition and other public policy areas.

3. That phase-in plans be evaluated by the SEB and presented to the selecting official in a manner which separates them from the criteria scoring systems; and that phase-over costs be evaluated and presented separately from operating costs.

4. That Field Center support service operating plans be developed to serve as an institutional resources management tool, but that they not be used as procurement review and approval documents.

SECTION VIII

MANAGEMENT OF THE PROCESS

Planning and executing the acquisition of hardware, services and knowledge is a vast and complex enterprise consuming much of the total effort of the Agency. It places heavy demands on the time and energies of our top managers at all levels of the organization. There is no escape from these demands: in fact, it is the general conclusion of the study that they will require even greater exertions from our managers and more continuous attention to the process all along the line.

Without in any way discounting the enormous amount of good work that has been and is being done, there are a number of general considerations which are offered to improve the over-all management of our acquisition activities. In discussing these, we should note that we have deliberately stayed away from the specific documents involved in the system and the step-by-step way in which they flow from one station to another, and what is done with them at each station. We have, however, heard graphic presentations on the intricate maze through which large amounts of paper now flow as part of our acquisition process. It seems that these procedures began modestly enough when NASA was first created, but that they have grown through the years until today we face lead times in the neighborhood of one year or more for our major acquisitions of hardware and services.

These paperwork procedures were studied by the Procurement Lead Time Review Committee in 1968 and some of the steps they recommended are now being implemented to eliminate and reduce forms and shorten review cycles which together are expected to chop about one hundred days from the total process. This is a noteworthy first step, and we should try valiantly for sizable additional reductions beyond that.

We have observed a number of management practices during the study which we feel are ripe areas for further cuts to processing time. The first of these is serial review of most documents at different levels of the organization. In Headquarters, this practice is compounded by a tendency toward "echelonitis" between the program offices and general management, as well as within each of these levels. It is suggested that we change our working relationships by encouraging direct participation of reviewing authorities while necessary project and procurement documentation is actually being prepared, and that review of the written word, to the extent it has to be done, be carried out in parallel rather than in series, with some sort of wrap-up meeting called to solve problems and get concurrences.

A second general practice is the tendency of many to rely on paper for discussing and resolving problems, giving comments and concurrences, and so on. It would seem that the quality of work would not diminish, and might even improve, if more emphasis were given to personal interaction as a means for resolving problems, rather than exchange of memoranda. One worthy example of the personalized approach was the way in which the Action Group implemented the new procurement directive on December 1, 1970: an oral explanation to the key people of each Center, followed by a thrashing out of problems involved in putting the policy into practice.

It is suggested that the reviews of our paperwork continue full tilt in both the Headquarters and the Field Centers. The NASA Management Council is monitoring these efforts in Headquarters, and it is suggested that Center Directors bring the Center-level reviews under their personal surveillance. We need to develop a good way to share among all Centers the good ideas for speeding our processes put to work at any one of them.

Finally, the suggestions and recommendations are for the most part pointed to greater participation of managers in project planning and in source solicitation, evaluation, and selection. The project planning approach advocated in Section III, if adopted, would be a challenging course

for the Centers and program offices, as well as for Agency general management. Though flexible, its total-project features would require highly-disciplined planning techniques and good coordination between line and functional managers.

Sections IV through VII contain suggestions for greater involvement of line managers in source solicitation, evaluation, and selection. At Center level, the job will be bigger than ever. The recently-installed "master buy" procedure involves the Administrator as selecting official only in those procurements of high dollar value or which are otherwise important on the base of selective judgment rather than an arbitrary dollar value. The remainder will stay at the Field Center level. The great attraction of "master buy" as a time-saver should not blind us to the additional burden it puts on the Centers to make sure that delegated procurements are of high quality and that they move expeditiously. It also puts greater reliance on timely after-the-fact reviews by Headquarters functional managers.

In the particular case of the SEB procedures, these have been set up in a formal and controlled way in order to ensure integrity in the evaluation process and to promote security. We suspect that the measure of independence and isolation this gives to the SEB has been interpreted by some managers to mean that they are absolved of responsibility in this area. We have tried to make the point that the process should be managed in a way that does not compromise the evaluation process, but this does not mean that management is not responsible for the quality of SEB work and for advising the selection official during the selection process.

We have advocated greater line management involvement in the management of that process, specifically as follows:

1. That the high priority of SEB work be recognized and emphasized; and that, to the extent possible, Boards be composed of experienced personnel serving full time during the evaluation of proposals;

2. That the SEB operating plan be reviewed carefully to assure that the Board is properly organized and staffed, that its proposed operating procedures are sound, and that realistic schedules are set for accomplishing its work;

3. That SEB members are adequately instructed on relevant policy issues and problems before proceeding with their work;

4. That Center-level SEB advisers, working closely with the central group established for this purpose in Headquarters, be appointed to assist Center management in guiding and instructing SEB members;

5. That Statements of Work and evaluation criteria be reviewed to make sure they square with Agency objectives, and that they are limited to a proper level of detail in clearly spelling out the Agency's requirement;

6. That SEB reports and presentations be reviewed for accuracy, clarity, consistency, and brevity, and that they are ready for presentation to the selecting official;

7. That Center Directors and Program Associate Administrators personally participate as much as possible in Administrator-level source selections.

In summary, the design and monitoring of a proper acquisition system are the responsibilities of functional management. Responsibility for the operations conducted in accordance with the system rests with line management. Both should be conducted aggressively, mindful of the role and needs of the other.

Recommendations on Management of the Process

1. That Center Directors personally monitor Center-level efforts for reducing acquisition lead times.

2. That management more aggressively supervise the processes relating to project planning and source evaluation and selection.

SECTION IX

IMPLEMENTATION PLAN

This section proposes a plan for the implementation of the recommendations set forth in this report, to the extent they are approved.

1. Three committees should be formed, as follows:

   a. Project Planning Committee would:

      (1) revise existing directives and prepare directives to implement the approach outlined in Section III;

      (2) study the project approval documentation and propose such action as is necessary to fit it properly into the total system.

   b. RFP Committee would review present procedures and practices regarding substantive and documentation RFP requirements and propose changes to simplify the RFP and reduce documentation requirements.

   c. SEB Committee would:

      (1) prepare a plan for implementing the approach to evaluate proposals (mission suitability/cost/other factors);

      (2) review present practices and propose guidelines for preparing evaluation criteria;

      (3) prepare instructions that support contract phase-in plans will be evaluated separately from the scoring system and that phase-over costs will be evaluated and presented separately from the estimated cost of operating under the new contract;

(4) revise the SEB manual and other directives to incorporate the above and to clarify and emphasize management responsibilities for SEB operations summarized in Section VIII.

2. The Acquisition Lead Time effort under the Director of Procurement should continue its work to reduce paperwork and processing times. The Management Council should continue to monitor this effort in Headquarters, and the Center Directors should personally monitor these studies in their own Centers.

3. The Office of Organization and Management should continue to serve as Agency policy focus for support services contracting.

4. The Ad Hoc Action Group should continue in existence to:

a. Direct the implementation of actions flowing from this study as they are approved by management. One action which should be implemented immediately is the revised debriefing policy.

b. Review technical transfusion with respect to treatment of data in proposals for both major and minor procurements.

c. Develop effective ways to instruct the Field Centers on the more important policy and procedural changes flowing from the study.

d. Discuss with the managements of the Centers their range of responsibilities in the acquisition process.

5. The Acquisition Study Steering Group should continue in existence to guide the work of the committees and to review their products prior to line management approval.

6. The Director of Procurement should develop a booklet describing the acquisition process and arrange for its distribution throughout the aerospace community.

7. The Acquisition Study Project Manager should coordinate all of the above efforts for the Associate Administrator for Organization and Management.

8. Schedule

a. Committees should be appointed immediately after approval of recommendations. They should complete their work 90 days after appointment.

b. Implementation of all items other than those of a continuing nature should be completed in 90 days.

APPENDIX

1. Memorandum from Administrator to Assistant Administrator for Industry Affairs, "NASA Acquisition of Services and Hardware," dated September 1, 1970.

2. Memorandum from Assistant Administrator for Industry Affairs to Administrator, "Study Plan: NASA Acquisition of Services and Hardware," dated September 15, 1970.

3. Memorandum from Acting Administrator to Associate Administrator for Organization and Management, "Management Study: NASA Acquisition of Services and Hardware," dated September 18, 1970.

4. Study Approach

5. In-house Survey Teams

6. Study Panels

7. Companies Visited by Steering Group Chairman

8. Action Group

9. Action Items of the Action Group

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

OFFICE OF THE ADMINISTRATOR

September 1, 1970

TO: K/Assistant Administrator for Industry Affairs

FROM: A/Administrator

SUBJECT: NASA Acquisition of Services and Hardware

NASA's organization, methods and procedures for acquiring its services and hardware requirements have more than adequately met NASA's national objectives of the past decade. The procurement policies NASA has evolved through experience are, I believe, sound ones which have in general fairly treated our contractors while giving NASA excellent value for its money. There is no system which cannot be improved upon, however, and now we are planning future programs in a changing economic environment with more limited resources. Therefore, I am directing you to recommend to Dr. Low and me within ten days the means to conduct a comprehensive review and analysis of the complete NASA acquisition process from determination of requirements through final contract award.

Your review shall include all ingredients from the initial definition of the Agency's needs through the source selection process including final selection and award of contracts. In developing your recommendations for the means to accomplish this searching review, you should consider all resources within and outside of NASA which in your judgment would contribute to a complete, comprehensive study of our present practices and future needs.

T. O. Paine

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

OFFICE OF THE ADMINISTRATOR

September 15, 1970

MEMORANDUM

TO : A/Administrator

FROM : K/Assistant Administrator for Industry Affairs

SUBJECT: Study Plan: NASA Acquisition of Services and Hardware

On September 1 you requested me to recommend the methods of conducting a comprehensive review and analysis of the complete NASA acquisition process. My approach has been to identify as a focus for this effort the most vital elements of the acquisition process, rather than all aspects of the subject. Accordingly, I recommend the following areas for review:

a. The definition of requirements.

b. The review and approval process, to include matching of requirements with available budgetary resources.

c. The process for fulfilling requirements in the competitive market place.

d. The source selection process, in its broad context.

e. Contracting methods and governing policies.

f. Management of the above activities by project, program, and functional organizations.

The recommended study approach is to review existing applicable policies, regulations, and procedures and to determine those modifications, deletions, or additions which are desirable at this time. As appropriate, representatives of industry may be consulted on these matters. Case histories from NASA and other agencies should be examined to define potential problem areas, lessons which can be learned from experience, and areas in which exceptions to established principles may periodically be necessary to meet the needs of the Agency.

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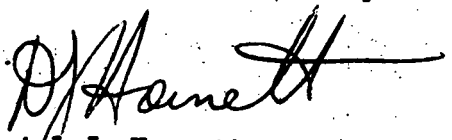
It is recommended that this review and analysis above be conducted primarily by NASA personnel, with outside organizations participating in separable segments, if it is deemed advisable. These NASA personnel should include Center, Program and Headquarters experts in the various fields to be reviewed. They should be organized into project teams reporting to a project manager. I recommend that you appoint Mr. Ray Kline as project manager for this effort.

A further recommendation is the establishment of a NASA steering group reporting to the Administrator to guide this study, make interim reports to the Administrator on a monthly basis, review findings and submit final recommendations to the Administrator. Steering group membership should include: Mr. Richard C. McCurdy, Designate Associate Administrator for Organization and Management, Chairman; Mr. Spencer M. Beresford, General Counsel; Mr. Charles W. Mathews, Deputy Associate Administrator, Manned Space Flight; Mr. Donald Hearth, Deputy Director, Goddard Space Flight Center; Admiral C. E. Weakley, Assistant Administrator for Management Development and Mr. Daniel J. Harnett, Assistant Administrator for Industry Affairs. The steering group should submit a final report by March 1, 1971.



Daniel J. Harnett

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

OFFICE OF THE ADMINISTRATOR

September 18, 1970

TO: D/Associate Administrator for Organization and Management

FROM: A/Acting Administrator

SUBJECT: Management Study: NASA Acquisition of Services and Hardware

I have reviewed Mr. Harnett's memorandum of September 15, 1970, written in response to the Administrator's request of September 1, 1970, concerning a review of NASA's acquisition process of services and hardware. I am now requesting that you chair a steering group to guide a comprehensive study of the complete NASA acquisition process within the framework set forth in this memorandum.

The study should focus on the most vital elements of the acquisition process, including:

a. The definition of requirements

b. The review and approval process

c. The source evaluation and selection process

d. Contracting methods and governing policies

e. Management of the acquisition process by project, program, and functional organizations

You may want to suggest additions or changes in the areas to be studied as the review proceeds. For each of the areas, you should review existing applicable policies, regulations, and procedures and determine those modifications, deletions, or additions which are desirable at this time. As appropriate, representatives of industry may be consulted on these matters. Case histories from NASA and other agencies should be examined to define potential problem areas, lessons which can be learned from experience, and areas in which exceptions to established principles may periodically be necessary to meet the needs of the Agency.

The study should be conducted by project teams, headed by team leaders, reporting to a project manager for the overall study. These teams should consist of the best people we can find for their respective areas of review. You are authorized to appoint all team members and team leaders. I am appointing Mr. Ray Kline as project manager for the Acquisition Study.

I am establishing a NASA steering group, with you serving as chairman, to guide the study, monitor its progress, review findings and recommendations, and to present the results to me. The steering group will include:

Chairman:

Richard C. McCurdy, Associate Administrator for Organization and Management

Members:

Spencer M. Beresford, General Counsel

Daniel J. Harnett, Assistant Administrator for Industry Affairs

Donald Hearth, Deputy Director, Goddard Space Flight Center

Edwin C. Kilgore, Deputy Associate Administrator (Management), Advanced Research and Technology

Charles W. Mathews, Deputy Associate Administrator, Manned Space Flight

Admiral C. E. Weakley, Assistant Administrator for Management Development

Please keep me informed of the progress of the study; the final report should be presented to me by March 1, 1971.

George M. Low

George M. Low

STUDY APPROACH

The study was conducted in three primary phases.

The purpose of Phase I, the Preliminary Survey Phase, was to collect the views of key NASA people involved in the acquisition process at all levels of the organization, and the views of executives of companies doing a major share of NASA's business, on how well current practices are satisfying the objectives of the acquisition process.

The in-house survey was conducted by four two-man survey teams, each consisting of a senior Headquarters and Field Center representative, who held discussions with more than three hundred people in the Headquarters program offices and in the Field Centers. Team assignments were arranged so that no team member surveyed his own organization. The study leadership also met for two days with key Headquarters officials who oversee the acquisition process to hear their views on the process and its problems, and followed this with a roundtable discussion with the Field Center procurement officers.

The industry survey was conducted personally by the Steering Group Chairman, who interviewed key executives of nineteen companies which in composite are doing more than two-thirds of the Agency's volume of business in 1971. Contacts in each company were made at or near the level of the principal executive in charge of space activities.

Beginning in this phase and continuing through the course of the study, the study leadership searched for superior practices and techniques among the Department of Defense and other organizations involved in major systems acquisitions. Discussions were held with project managers in the Navy Department, procurement directors in the Air Force, and management systems personnel at the DoD level to review changes under way and contemplated in the DoD acquisition process; and reviews were made of several recent study reports on the DoD weapons systems acquisition process.

The objective of Phase II, In-Depth Study, was to study in detail those matters identified in the Phase I survey as needing particular attention. These matters fell in two general areas--project planning; and source evaluation and selection--and two panels were organized to study these areas. Membership of both panels consisted of senior representatives from the Field Centers, Program Offices, and Headquarters Offices.

The Project Planning Panel reviewed project planning from the advanced concept study to the detailed design and development of various classes of flight hardware. Interaction between project planning and important other activities, such as Agency long-range planning, the budget cycle and the procurement process, was studied in detail. An important question reviewed was the appropriate point or points during project planning when competition should take place, and the proper role for NASA in the handling of technical information, both proprietary and non-proprietary, during competitive phases. The panel also reviewed Agency techniques for estimating project costs.

The Source Evaluation and Selection Panel reviewed current Agency policies and practices from the preparation of the procurement plan through contract award, including requests for proposal, evaluation board activities, source selection and debriefings. Two sub-panels were established to consider separately the process for hardware and support contracting to permit more specialized attention to matters in the latter area, such as the policy for recompetition and consideration of phase-over costs. The panel also considered line management participation in the acquisition process and the flow of documents for review and approval.

Both panels presented interim oral reports to the Steering Group and in late January delivered working papers to the Chairman.

In Phase III, Study Integration and Report Preparation, the Steering Group Chairman and the Project Manager considered the results of the above activities; discussed the major issues and recommendations with Steering Group members, Field Center Directors, Program Associate Administrators, functional managers, and Agency top management; and prepared a draft report for consideration by the Steering Group.

Periodic status reports were presented to the Office of Management and Budget and to staff members of the Senate and House Space Committees at timely intervals during the study.

An ad hoc Action Group was established at the beginning of the study to oversee the implementation by the organization of specific actions affecting the acquisition process as such actions were developed and approved by management. The existence of a senior management-level team comprised of individuals with management responsibilities avoided the potential problem of ongoing efforts for process improvement being suspended while the Acquisition Study was under way. In addition, the Action Group provided an effective mechanism to proceed immediately with the implementation of certain corrective measures flowing from the study where these improvements could be implemented without awaiting completion of the entire study.

IN-HOUSE SURVEY TEAMS

Members	Assignments
I	
R. Ginter, Director, Special Programs Office, Office of Advanced Research & Technology, NASA Hdqtrs.	Office of Manned Space Flight, Manned Spacecraft Center, Marshall Space Flight Center
R. Ziemer, Deputy Director of Projects, Goddard Space Flight Center	
II	
M. Rosen, Senior Scientist, Office of DoD and Interagency Affairs, NASA Hdqtrs.	Office of Space Science and Applications, Goddard Space Flight Center, Flight Research Center, Jet Propulsion Laboratory
D. W. Lang, Director, Program Control & Contracts, Manned Spacecraft Center	
III	
C. J. Donlan, Deputy Associate Administrator (Technical), Office of Manned Space Flight, NASA Hdqtrs.	Office of Tracking and Data Acquisition, Deputy Associate Adminis- trator for Planning, Kennedy Space Center, Wallops Station
E. Draley, Director for Center Development, Langley Research Center	
IV	
H. R. Brockett, Deputy Associate Administrator, Office of Tracking & Data Acquisition, NASA Hdqtrs.	Office of Advanced Research and Technology, Langley Research Center, Lewis Research Center, Ames Research Center
L. B. James, Director, Program Management, Marshall Space Flight Center	

STUDY PANELS

Contracting, Source Evaluation and Selection

Mr. Gerald M. Truszynski - Associate Administrator, Office of Tracking and Data Acquisition — Chairman
Mr. Anthony G. Carretta - Procurement Office
Mr. Edward F. Parry - Office of General Counsel
Mr. Charles A. Taylor - Office of Tracking & Data Acquisition
Mr. David G. Stone - Langley Research Center
Mr. Samuel W. Keller - Goddard Space Flight Center
Mr. Douglas R. Lord - Office of Manned Space Flight
Mr. David H. Newby - Marshall Space Flight Center
Mr. Walter F. Barney - Kennedy Space Center
Mr. Dave W. Lang - Manned Spacecraft Center
Mr. Joseph G. Thibodeaux, Jr. - Manned Spacecraft Center
Mr. Joseph B. Mahon - Office of Space Science & Applications
Mr. Joseph P. Click - Jet Propulsion Laboratory
Mr. Leonard Carulli - Office of Management Development
Mr. Francis B. Smith - Office of University Affairs
Mr. Merrill H. Mead - Ames Research Center

Project Planning

Mr. Robert E. Bourdeau - Goddard Space Flight Center — Chairman
Mr. Ernest A. Neil - Goddard Space Flight Center
Mr. Francis L. Williams - Office of Deputy Associate Administrator (Planning)
Mr. James R. Elliott - Office of Management Development
Mr. William E. Stoney, Jr. - Office of Manned Space Flight
Dr. Jack W. Wild - Office of Manned Space Flight
Mr. Robert J. Parks - Jet Propulsion Laboratory
Mr. Bill H. Sneed - Marshall Space Flight Center
Mr. Herbert A. Wilson, Jr. - Langley Research Center
Mr. Jesse L. Mitchell - Office of Space Science & Applications
Mr. Bernard Maggin - Office of Advanced Research & Technology

Companies Visited by Steering Group Chairman for Industry Survey

Aerojet-General Corporation

Bendix Aerospace-Electronics Company

The Boeing Company

Fairchild Hiller Corporation

Federal Electric Corporation

Garrett Corporation

General Dynamics Corporation

General Electric Space Division

Grumman Corporation

Hughes Aircraft Company

Internation Business Machines Corporation: Federal Systems Div.

Martin Marietta Corporation - Aerospace Group

North American Rockwell Corporation

Philco Ford

United Aircraft Corporation - Pratt & Whitney Aircraft Division

RCA Defense Electronics Products

Sperry Rand Corporation

TRW Systems Group

ACTION GROUP

Mr. Bernard Moritz, Chairman
Deputy Associate Administrator
for Organization and Management
NASA Headquarters

Mr. Neil Hosenball
Deputy General Counsel
NASA Headquarters

Mr. George Vecchietti
Director of Procurement
NASA Headquarters

ACTIONS TAKEN BY
ACQUISITION STUDY ACTION GROUP
DURING COURSE OF STUDY

1. Revision of policy directive on written and oral discussions with offerors in a competitive range to avoid technical transfusion during competition.

2. Establishment of single cut-off date for receipt of proposals.

3. Revision of policy on debriefings so that they will be held after contractor selection but prior to contract award.

4. Installation of scheme to feed back to active SEBs lessons learned from SEBs just completed.

5. Clarification of policy to avoid organizational conflict of interest among support contractors.

6. Establishment of SEB focal points in Field Centers with large volume of major procurements.

7. Amplification of NASA's policy objective that all competitors for its hardware procurements be accorded equal opportunity, specifically as follows:

   a. Encouraging all concerned to make NASA-sponsored contract study results available to competitors on an equal and timely basis when these results have a significant, direct, and known relationship to the work to be placed under contract, and

   b. Refraining all concerned from entering into study contracts with firms which have become associated with contractor teams interested in a related hardware procurement.

8. Treatment of support contractor phase-in and phase-out costs during source evaluation and selection.

9. Development of format to improve effectiveness of SEB presentations to the Source Selecting Official.

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